U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-269 263

Lake Lyndon B. Johnson Burnet and LLano Counties Texas

National Eutrophication Survey, Corvallis, Oreg

Prepared for

Corvallis Environmental Research Lab, Oreg

Apr 77

PB 269 263

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EUTROPHICATION SURVEY
WORKING PAPER SERIES

CORVALLIS ENVIRONMENTAL RESEARCH LABORATORY - CORVALLIS, OREGON
and
ENVIRONMENTAL MONITORING & SUPPORT LABORATORY - LAS VEGAS, NEVADA

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

EPA-600/3-77-087
August 1977

REPORT

ON

LAKE LYNDON B. JOHNSON

BURNET AND LLANO COUNTIES

TEXAS

EPA REGION VI

WORKING PAPER NO. 645

WITH THE COOPERATION OF THE

TEXAS WATER QUALITY BOARD

AND THE

TEXAS NATIONAL GUARD

APRIL, 1977

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE Report on Lake Lyndon B. Johnson, Burnet and Llano Counties, Texas	5. REPORT DATE Prepared April 1977 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) Anonymous (National Eutrophication Survey Staff)	8. PERFORMING ORGANIZATION REPORT NO. Working Paper # 645
9. PERFORMING ORGANIZATION NAME AND ADDRESS National Eutrophication Survey U.S. Environmental Protection Agency 200 S. W. 35th St. Corvallis, Oregon 97330	10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO.
12. SPONSORING AGENCY NAME AND ADDRESS Office of Research and Development U.S. Environmental Protection Agency 401 M Street, S. W. Washington, DC 20460	13. TYPE OF REPORT AND PERIOD COVERED Final - 1974 14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

Prepared in cooperation with the U.S. Environmental Protection Agency, National Environmental Research Center, Las Vegas, Nevada 89114

16. ABSTRACT

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
eutrophication lakes nutrients phosphorus nitrogen loading		08H 08C

18. DISTRIBUTION STATEMENT Release unlimited	19. SECURITY CLASS (This Report) 20. SECURITY CLASS (This page)	21. NO. OF PAGES 56 22. PRICE PC4 - A01

EPA Form 2220-1 (9-73)

CONTENTS

	Page
Foreword	ii
List of Texas Study Reservoirs	iv
Lake and Drainage Area Map	vi
Sections	
I. Conclusions	1
II. Lake and Drainage Basin Characteristics	4
III. Lake Water Quality Summary	5
IV. Nutrient Loadings	11
V. Literature Reviewed	17
VI. Appendices	18

FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nation-wide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGEMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Texas Water Quality Board for professional involvement, to the Texas National Guard for conducting the tributary sampling phase of the Survey, and to those Texas wastewater treatment plant operators who voluntarily provided effluent samples.

Hugh C. Yantis, Jr., Executive Director of the Texas Water Quality Board, and John B. Latchford, Jr., Director, and the staff of the Field Operations Division provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

Major General Thomas Bishop, the Adjutant General of Texas, and Project Officer Colonel William L. Seale, who directed the volunteer efforts of the Texas National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

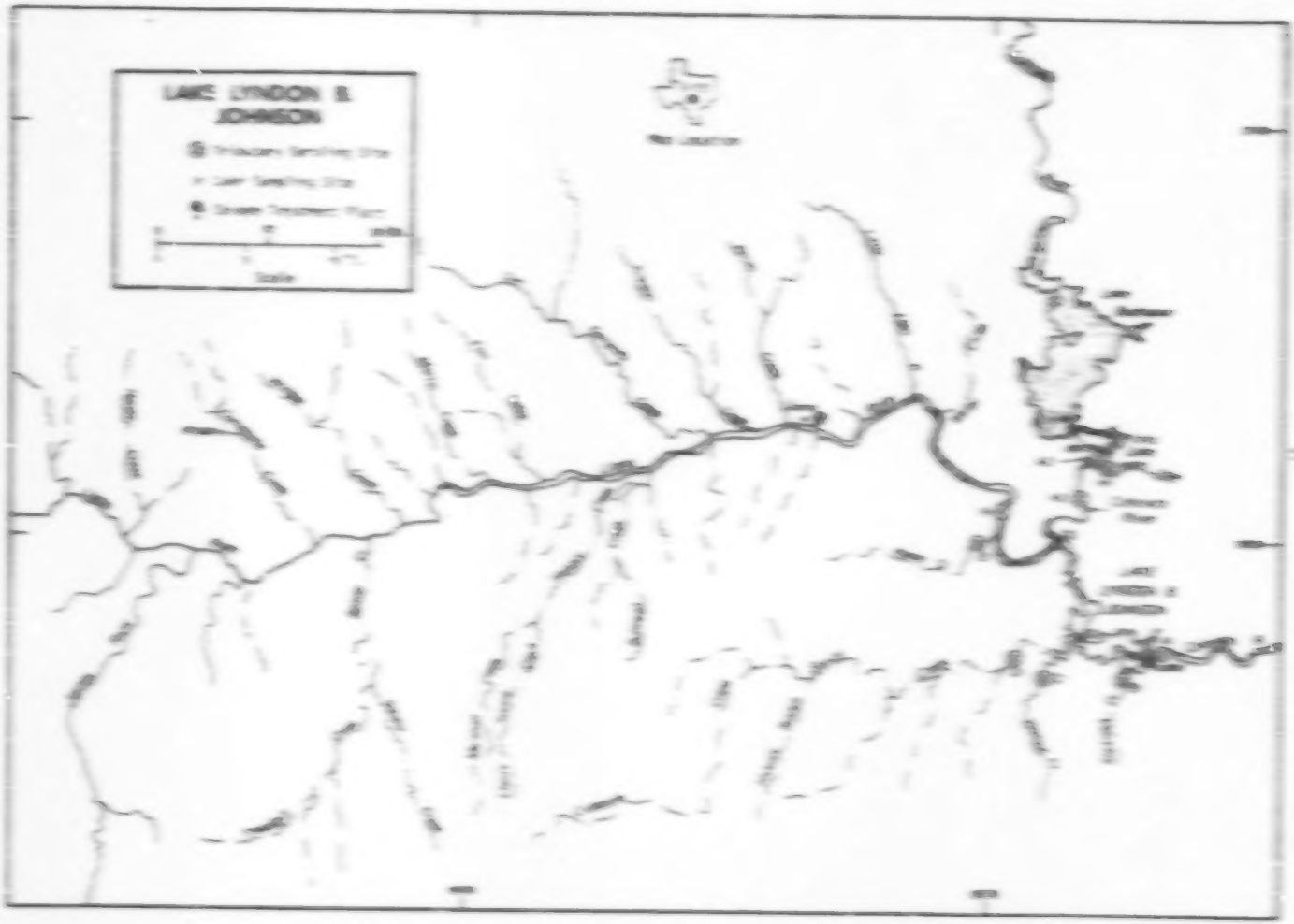
NATIONAL EUTROPHICATION SURVEY

STUDY RESERVOIRS

State of Texas

NAME	COUNTY
Amistad	Val Verde
Bastrop	Bastrop
Belton	Bell, Coryell
Braunig	Bexar
Brownwood	Brown
Buchanan	Burnet, Llano
Caddo	Harrison, Marion, TX; Caddo Parish, LA
Calaveras	Bexar
Canyon	Comal
Colorado City	Mitchell
Corpus Christi	Jim Wells, Live Oak, San Patricio
Diversion	Archer, Baylor
Eagle Mountain	Tarrant, Wise
Fort Phantom Hill	Jones
Houston	Harris
Kemp	Baylor
Lake O'The Pines	Camp, Marion, Morris, Upshur
Lavon	Collin
Lewisville (Garza-Little Elm)	Denton
Livingston	Polk, San Jacinto, Trinity, Walker

Lyndon B. Johnson	Burnet, Llano
Medina	Bandera, Medina
Meredith	Hutchinson, Moore, Potter
O. C. Fisher (San Angelo)	Tom Green
Palestine	Anderson, Cherokee, Henderson, Smith
Possum Kingdom	Palo Pinto, Stephens, Young
Sam Rayburn	Angelina, Jasper Nacogdoches, Sabine, San Augustine
Somervitle	Burleson, Lee, Washington
E. V. Spence	Coke
Stamford	Haskell
Stillhouse Hollow	Bell
Tawakoni	Hunt, Rains, Van Zandt
Texoma	Cooke, Grayson TX; Bryan, Johnston, Love, Marshall, OK
Travis	Burnet, Travis
Trinidad	Henderson
Twin Buttes	Tom Green
White River	Crosby
Whitney	Bosque, Hill
Wright Patman (Texarkana)	Bowie, Cass


LAKE LYNDON B.
JOHNSON

LAKE LYNDON B. JOHNSON

STORET NO. 4821

I. CONCLUSIONS

A. Trophic Condition:

Survey data indicate that Lake Lyndon B. Johnson is eutrophic; i.e., well supplied with nutrients and quite productive. Whether nutrient enrichment is beneficial or deleterious depends on the actual or potential effect on the uses of the lake. In this regard, no nuisance conditions are known to personnel of the Texas Water Quality Board and there is little or no impairment of the designated beneficial uses of this water body.

Lake Lyndon B. Johnson ranked twenty-ninth in overall trophic quality when the 39 Texas reservoirs sampled in 1974 were compared using a combination of six parameters*. Twenty-two of the reservoirs had less and two had the same median total phosphorus, 25 had less and three had the same median dissolved phosphorus, 34 had less median inorganic nitrogen, 13 had less mean chlorophyll a, and 18 had greater mean Secchi disc transparency. Marked depression of hypolimnetic dissolved oxygen occurred at stations 1 and 2 in May and August.

Survey limnologists noted a few patches of emergent macrophytes.

* See Appendix A.

B. Rate-Limiting Nutrient:

The algal assay results indicate that primary productivity in Lake Lyndon B. Johnson was phosphorus limited at the times the samples were collected (03/13/74 and 11/04/74). The lake data indicate phosphorus limitation at all sampling times.

C. Nutrient Controllability:

1. Point sources--The phosphorus contributions of domestic point sources amounted to an estimated 47% of the total load reaching Lake Lyndon B. Johnson during the sampling year. The Sunrise Beach and Lake L.B.J. municipal utility districts collectively contributed an estimated 38.6% of the total load directly to the lake, and the Llano wastewater treatment plant contributed an estimated 7.3%.

The present phosphorus loading of 1.39 $g/m^2/yr$ exceeds that proposed by Vollenweider (Vollenweider and Dillon, 1974) as a eutrophic loading (see page 15). It is calculated that 80% removal of phosphorus at the three point sources would reduce the loading to 0.87 $g/m^2/yr$; i.e., a mesotrophic loading. If Vollenweider's mesotrophic level is applicable to Texas reservoirs, the reduced loading should result in improvement in the trophic condition of Lake Lyndon B. Johnson.

2. Non-point sources--The phosphorus contributions of non-point sources accounted for an estimated 53% of the total phosphorus load during the sampling year. The Colorado River con-

tributed 41.6%, the Llano River contributed 4.7%, and the remaining four gaged tributaries collectively contributed 4.5% of the total load.

The nutrient export rates of the gaged tributaries were very low during the sampling year (see page 15) and averaged less than 1 kg P and about 26 kg N/km^2.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS†

A. Morphometry††:

1. Surface area: 25.80 kilometers².
2. Mean depth: 6.7 meters.
3. Maximum depth: =24.4 meters.
4. Volume: 172,860 x 10^6 m^3.
5. Mean hydraulic retention time: 56 days (based on outflow).

B. Tributary and Outlet:
(See Appendix C for flow data)

1. Tributaries -

Name	Drainage area (km^2)*	Mean flow (m^3/sec)*
Slickrock Creek	23.3	0.05
Walnut Creek	63.6	0.13
Sandy Creek	846.9	1.67
Honey Creek	100.0	0.21
Llano River	11,473.7	9.66
Colorado River	81,092.8	22.17
Minor tributaries & immediate drainage -	365.1	3.54
Totals	93,965.3	37.43

2. Outlet -

Colorado River	93,991.1**	35.82

C. Precipitation***:

1. Year of sampling: 89.4 centimeters.
2. Mean annual: 69.5 centimeters.

† Table of metric conversions--Appendix B.
†† Butler, 1974.
* For limits of accuracy, see Working Paper No. 173, "...Survey Methods, 1973-1976".
** Includes area of lake.
*** See Working Paper No. 175.

III. WATER QUALITY SUMMARY

Lake Lyndon B. Johnson was sampled four times during 1974 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from three stations on the lake and from a number of depths at each station (see map, page vi). During each visit, a single depth-integrated (4.6 m to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the March and November visits, single 18.9-liter depth-integrated samples were composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 24.4 meters at station 1, 14.3 meters at station 2, and 7.0 meters at station 3.

The sampling results are presented in full in Appendix D and are summarized in the following table (nutrient samples collected in August were not preserved properly and were not analyzed).

A SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR LYNDEN & JOHNSON LAKE
STUDY DATE 1981

	1ST SAMPLING : 5/13/74			2ND SAMPLING : 5/20/74			3RD SAMPLING : 6/10/74		
	3 SITES			3 SITES			3 SITES		
PARAMETER	RANGE	MEAN	MEDIAN	RANGE	MEAN	MEDIAN	RANGE	MEAN	MEDIAN
TEMP (C)	12.3 - 18.3	17.3	18.0	15.1 - 25.3	24.1	24.8	19.8 - 24.9	23.4	23.6
DISS OXY (MG/L)	5.8 - 6.2	6.1	6.0	6.1 - 6.8	2.2	1.0	6.1 - 7.2	6.1	6.2
CNDCTVY (MCHOMO)	33[illegible] - 46[illegible]	42[illegible]	45[illegible]	27[illegible] - 46[illegible]	46[illegible]	43[illegible]	37[illegible] - 54[illegible]	48[illegible]	53[illegible]
PH (STAND UNITS)	7.6 - 8.5	8.3	8.4	7.6 - 8.[illegible]	8.1	7.9	7.7 - 8.6	8.1	8.0
TOT ALK (MG/L)	15[illegible] - 24[illegible]	16[illegible]	15[illegible]	16[illegible] - 24[illegible]	22[illegible]	13[illegible]	[illegible]	[illegible]	[illegible]
TOT P (MG/L)	0.016 - 0.050	0.025	0.022	0.025 - 0.133	0.056	0.046	[illegible]	[illegible]	[illegible]
DISS P (MG/L)	0.004 - 0.011	0.007	0.005	0.006 - 0.029	0.015	0.012	[illegible]	[illegible]	[illegible]
NO2+NO3 (MG/L)	0.230 - 0.456	0.478	0.523	0.268 - 0.582	0.386	0.378	[illegible]	[illegible]	[illegible]
AMMONIA (MG/L)	0.021 - 0.386	0.037	0.028	0.042 - 0.198	0.078	0.050	[illegible]	[illegible]	[illegible]
KJEL N (MG/L)	0.388 - 0.788	0.413	0.468	0.388 - 0.480	0.529	0.508	[illegible]	[illegible]	[illegible]
INORG N (MG/L)	0.256 - 0.782	0.387	0.536	0.288 - 0.628	0.[illegible]	0.446	[illegible]	[illegible]	[illegible]
TOTAL N (MG/L)	0.538 - 1.138	0.893	0.946	0.558 - 1.156	0.[illegible]	0.[illegible]	[illegible]	[illegible]	[illegible]
CHLRPHYL A (MG/L)	5.2 - 6.9	6.2	6.4	5.2 - 32.4	17.8	12.4	3.7 - 7.6	5.7	6.0
SECCHI (METERS)	8.9 - 3.2	3.8	3.9	8.7 - 8.9	6.8	6.9	8.3 - 2.8	3.8	3.5

[illegible] SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR [illegible] AT [illegible]
[illegible]

[illegible] SAMPLING YEAR [illegible]

PARAMETER	3 SERIES RANGE	MEAN	MEDIAN
TEMP (C)	25.4 - 25.4	25.7	25.7
DISS OXY (MG/L)	8.0 - 8.2	7.6	7.8
CNDCTVY (MICROMHO)	500. - 550.	525.	524.
PH (STAND UNITS)	7.7 - 8.1	7.9	8.0
TOT ALK (MG/L)	96. - 134.	127.	126.
TOT P (MG/L)	0.039 - 0.111	0.069	0.064
DIFNG P (MG/L)	0.013 - 0.025	0.019	0.019
NO2+NO3 (MG/L)	0.240 - 0.248	0.253	0.250
AMMONIA (MG/L)	0.029 - 0.246	0.047	0.038
KJEL N (MG/L)	0.280 - 0.480	0.427	0.400
INORG N (MG/L)	0.256 - 0.292	0.280	0.280
TOTAL N (MG/L)	0.442 - 0.768	0.640	0.678
CHLRPHYL A (UG/L)	2.5 - 5.1	3.5	2.9
SECCHI (METERS)	8.0 - 8.4	8.7	8.8

B. Biological characteristics:

1. Phytoplankton * -

Sampling Date	Dominant Genera	Algal Units per ml
03/13-14/74	1. Scenedesmus sp.	790
	2. Dactylococcopsis sp.	266
	3. Centric diatoms	214
	4. Synedra sp.	120
	5. Cryptomonas sp.	120
	Other genera	214
	total	1,239
06/21/74	1. Flagellates	1,304
	2. Crucigenia sp.	783
	3. Centric diatoms	781
	4. Nitzschia sp.	522
	5. Scenedesmus sp.	456
	Other genera	2,413
	total	6,261
11/04/74	1. Cryptomonas sp.	188
	2. Melosira sp.	125
	3. Stephanodiscus sp.	125
	4. Pennate diatoms	125
	5. Scenedesmus sp.	31
	Other genera	7
	total	596

* The August phytoplankton sample was lost in shipment.

2. Chlorophyll a -

Sampling Date	Station Number	Chlorophyll a (µg/l)
03/13-14/74	1	6.9
	2	5.2
	3	6.4
05/21/74	1	5.2
	2	32.9
	3	12.9
08/16/74	1	3.7
	2	7.0
	3	6.6
11/04/74	1	5.1
	2	2.5
	3	2.9

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

a. March sample -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	<0.005	0.560	0.1
0.050 P	<0.005	0.560	9.0
0.050 P + 1.0 N	<0.005	1.560	15.0
1.0 N	<0.005	1.560	0.1

b. November sample -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.010	0.271	1.1
0.050 P	0.060	0.271	7.9
0.050 P + 1.0 N	0.060	1.271	21.4
1.0 N	0.010	1.271	0.4

2. Discussion -

The control yields of the assay alga, Selenastrum capricornutum, indicate that the potential primary productivity of Lake Lyndon B. Johnson was low in March (03/13/74) but moderate in November (11/04/74). Increased yields with the addition of orthophosphorus indicate phosphorus limitation. Note that the additions of only nitrogen resulted in yields not significantly different from those of the controls.

The lake data also indicate phosphorus limitation; i.e., the mean inorganic nitrogen/orthophosphorus ratios were 16/1 or greater at all sampling times.

IV. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the Texas National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page vi), except for the months of April and May when two samples were collected. Sampling was begun in September, 1974, and was completed in August, 1975.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Texas District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loads shown are those measured minus point-source loads, if any.

Nutrient loads for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the means of the nutrient loads, in kg/km²/year, at stations B-1, C-1, D-1, and E-1 and multiplying the means by the ZZ area in km².

The City of Llano and the municipal utility districts of Sunrise Beach and Lake L.B.J. did not participate; nutrient loads from these sources were estimated at 1.134 kg P and 3.401 kg N/capita/year, and Llano flows were estimated at 0.3785 m³/capita/day.

* See Working Paper No. 175.

A. Waste Sources:

1. Known municipal -

Name	Pop. Served	Treatment	Mean Flow (m^3/d)	Receiving Water
Lake L.B.J. M.U.D.*	10,000	?	5,678.1	Lake L.B.J.
Sunrise Beach M.U.D.*	2,300	?	1,324.9	Lake L.B.J.
Llano**	2,200	stab. pond	823.?	Llano River

2. Known industrial - None

* Wyatt, 1976.
** Anonymous, 1971.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/yr	% of total
a. Tributaries (non-point load) -		
Slickrock Creek	19	<0.1
Walnut Creek	66	0.2
Sandy Creek	1,460	4.1
Honey Creek	70	0.2
Llano River	1,695	4.7
Colorado River	14,965	41.6
b. Minor tributaries & immediate drainage (non-point load) -	365	1.0
c. Known municipal STP's -		
Lake L.B.J. M.U.D.	11,340	31.5
Sunrise Beach M.U.D.	2,610	7.3
Llano	2,495	6.9
d. Septic tanks* -	465	1.3
e. Known industrial - None	-	-
f. Direct precipitation** -	450	1.2
Total	35,985	100.0

2. Outputs -

Lake outlet - Colorado River 34,975

3. Net annual P accumulation - 1,010 kg.

* Estimate based on 1,579 lakeshore dwellings and 16 parks; see Working Paper No. 175.
** See Working Paper No. 175.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/ yr	% of total
a. Tributaries (non-point load) -		
Stickrock Creek	800	0.1
Walnut Creek	2,240	0.2
Sandy Creek	19,030	2.0
Honey Creek	3,230	0.3
Llano Creek	236,370	23.6
Colorado River	630,955	63.2
b. Minor tributaries & immediate drainage (non-point load) -	11,320	1.2
c. Known municipal STP's -		
Lake L.B.J. M.U.D.	34,010	3.4
Sunrise Beach M.U.D.	7,820	0.8
Llano	7,480	0.7
d. Septic tanks* -	17,390	1.7
e. Known industrial - None	-	-
f. Direct precipitation** -	27,355	2.8
Total	998,300	100.0

2. Outputs -

Lake outlet - Colorado River 1,092,665

3. Net annual N loss - 94,365 kg.

* Estimate based on 1,579 lakeshore dwellings and 16 parks; see Working Paper No. 175.
** See Working Paper No. 175.

D. Non-point Nutrient Export by Subdrainage Area:

Tributary	kg P/km²/yr	kg N/km²/yr
Slickrock Creek	<1	34
Walnut Creek	<1	35
Sandy Creek	0	23
Honey Creek	<1	32
Llano River	<1	21
Colorado River	<1	6

E. Mean Nutrient Concentrations in Ungaged Stream:

Tributary	Mean Total P Conc. (mg/l)	Mean Total N Conc. (mg/l)
Peters Creek	0.012	0.513

F. Yearly Loads:

In the following table, the existing phosphorus loadings are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" loading is one at which the receiving water would become eutrophic or remain eutrophic; his "permissible" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic loading would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
grams/m^2/yr	1.39	0.04	38.7	"loss"*

Vollenweider phosphorus loadings ($g/m^2/yr$) based on mean depth and mean hydraulic retention time of Lake Lyndon B. Johnson:

"Dangerous" (eutrophic loading)	1.28
"Permissible" (oligotrophic loading)	0.64

* There was an apparent loss of nitrogen during the sampling year. This may have been due to nitrogen fixation in the lake, solubilization of previously sedimented nitrogen, recharge with nitrogen-rich ground water, unknown and unsampled point sources discharging directly to the lake, or underestimation of the minor tributary and immediate drainage load. Whatever the cause, a similar nitrogen loss has occurred at Shagawa Lake, Minnesota, which has been intensively studied by EPA's former National Eutrophication and Lake Restoration Branch (Maluey et al., 1975).

V. LITERATURE REVIEWED

Anonymous, 1971. Inventory of municipal waste facilities. EPA Publ. OWP-1, vol. 6, Wash. DC.

Butler, D. Wade, 1974. Fisheries management recommendations. Fed. Aid Proj. F-2-R-22, TX Parks & Wildl. Dept., Austin.

Latchford, John B. Jr.; 1974. Personal communication (lake morphometry). TX Water Qual. Bd., Austin.

Malueg, Kenneth W., D. Phillips Larsen, Donald W. Schults, and Howard T. Mercier; 1975. A six-year water, phosphorus, and nitrogen budget for Shagawa Lake, Minnesota. Jour. Environ. Qual.; vol. 4, no. 2, pp. 236-242.

Vollenweider, R. A., and P. J. Dillon, 1974. The application of the phosphorus loading concept to eutrophication research. Natl. Res. Council of Canada Publ. No. 13690, Canada Centre for Inland Waters, Burlington, Ontario.

Wyatt, Linda B, 1976. Personal communication (sewage treatment facilities). TX Water Qual. Bd., Austin.

VI. APPENDICES

APPENDIX A

LAKE RANKINGS

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	[illegible] TOTAL P	[illegible] INORG N	[illegible] SEC	[illegible] CHLOR	[illegible]	[illegible] SECCHI DEPTH P
[illegible]	[illegible] LAKE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] LAKE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] RESERVOIR	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] LAKE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] LAKE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	LAKE [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] LAKE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] LAKE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] RESERVOIR	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	LAKE [illegible] CITY	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] [illegible] LAKE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] LAKE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] MOUNTAIN LAKE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	FT [illegible] HILL LAKE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] LITTLE ELK RESERVOIR	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] LAKE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] LAKE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	LAKE OF THE PINES	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] RESERVOIR	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	LINCOLNSTON LAKE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] & [illegible] LAKE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] LAKE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	LAKE [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	PALESTINE LAKE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] [illegible] RESERVOIR	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	SAN [illegible] RESERVOIR	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	SAN [illegible] RESERVOIR	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	E O SPRING RESERVOIR	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] ranked in [illegible] lakes.

Rank	Lake Code	Lake Name	Index No.
1	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]	[illegible]
7	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]
11	[illegible]	[illegible]	[illegible]
12	[illegible]	[illegible]	[illegible]
13	[illegible]	[illegible]	[illegible]
14	[illegible]	[illegible]	[illegible]
15	[illegible]	[illegible]	[illegible]
16	[illegible]	[illegible]	[illegible]
17	[illegible]	[illegible]	[illegible]
18	[illegible]	[illegible]	[illegible]
19	[illegible]	[illegible]	[illegible]
20	[illegible]	[illegible]	[illegible]
21	[illegible]	[illegible]	[illegible]
22	[illegible]	[illegible]	[illegible]
23	[illegible]	[illegible]	[illegible]
24	[illegible]	[illegible]	[illegible]
25	[illegible]	[illegible]	[illegible]
26	[illegible]	[illegible]	[illegible]
27	[illegible]	[illegible]	[illegible]
28	[illegible]	[illegible]	[illegible]

PERCENT OF LAKES WITH HIGHER HG LEVEL THAN NUMBER OF LAKES WITH HIGHER HG LEVEL

LAKE CODE	LAKE NAME	[illegible] TOTAL #	[illegible] INDEX %	[illegible] SEC	[illegible] CYLINA	[illegible]	[illegible] 1155 [illegible] #	[illegible] %
[illegible]	[illegible] LAKE	45 (36)	5 (2)	128 (39)	188 (26)	35 (14)	43 (23)	46
[illegible]	[illegible] LAKE	76 (30)	74 (29)	82 (31)	47 (18)	17 (0)	92 (34)	34
[illegible]	[illegible] RESERVOIR	92 (35)	26 (10)	47 (17)	68 (26)	17 (0)	84 (32)	28
[illegible]	[illegible] LAKE	5 (2)	42 (16)	58 (19)	8 (3)	48 (17)	5 (2)	19
[illegible]	[illegible] LAKE	65 (25)	78 (29)	29 (11)	97 (33)	58 (22)	94 (35)	34
[illegible]	LAKE [illegible]	47 (18)	21 (7)	74 (28)	63 (24)	17 (0)	39 (14)	24
[illegible]	[illegible] LAKE	26 (10)	91 (33)	42 (16)	32 (12)	76 (29)	38 (18)	29
[illegible]	[illegible] LAKE	45 (17)	100 (38)	47 (18)	11 (4)	67 (25)	92 (34)	36
[illegible]	[illegible] RESERVOIR	66 (25)	8 (3)	95 (36)	47 (17)	49 (17)	97 (37)	44
[illegible]	LAKE [illegible] CITY	39 (14)	74 (28)	26 (10)	42 (16)	58 (22)	39 (14)	31
[illegible]	[illegible] [illegible] LAKE	8 (3)	47 (18)	18 (7)	13 (5)	91 (23)	8 (3)	15
[illegible]	[illegible] LAKE	68 (26)	83 (31)	32 (12)	28 (11)	97 (37)	63 (21)	37
[illegible]	[illegible] [illegible] LAKE	72 (27)	91 (33)	34 (13)	74 (28)	79 (30)	75 (28)	43
[illegible]	FT [illegible] [illegible] LAKE	24 (9)	66 (25)	21 (8)	74 (28)	95 (36)	16 (6)	24
[illegible]	[illegible] LITTLE ELM RESERVOIR	34 (13)	13 (5)	16 (6)	34 (13)	55 (21)	21 (7)	17
[illegible]	[illegible] LAKE	76 (29)	61 (23)	55 (21)	55 (21)	84 (32)	92 (34)	42
[illegible]	[illegible] LAKE	18 (6)	16 (6)	0 (0)	24 (9)	72 (27)	11 (4)	12
[illegible]	LAKE OF THE PINES	54 (20)	76 (29)	66 (25)	39 (15)	17 (0)	46 (17)	24
[illegible]	[illegible] RESERVOIR	21 (8)	29 (11)	3 (1)	84 (32)	100 (38)	21 (7)	25
[illegible]	[illegible] LAKE	3 (1)	3 (1)	34 (13)	26 (10)	17 (0)	3 (1)	9
[illegible]	[illegible] B JOHNSON LAKE	39 (14)	11 (4)	53 (20)	66 (25)	38 (14)	38 (14)	23
[illegible]	[illegible] LAKE	68 (25)	8 (3)	69 (26)	37 (14)	17 (0)	100 (38)	34
[illegible]	LAKE [illegible]	62 (23)	91 (33)	71 (27)	95 (36)	38 (14)	63 (23)	44
[illegible]	PALESTINE LAKE	74 (28)	32 (12)	63 (24)	53 (20)	49 (17)	51 (19)	34
[illegible]	[illegible] [illegible] RESERVOIR	74 (28)	91 (33)	84 (32)	58 (22)	17 (0)	97 (23)	36
[illegible]	SAN [illegible] RESERVOIR	13 (5)	45 (17)	8 (3)	8 (0)	88 (33)	46 (17)	18
[illegible]	SAN [illegible] RESERVOIR	59 (23)	24 (15)	68 (26)	76 (29)	17 (0)	63 (23)	32
[illegible]	E V SPENCE RESERVOIR	58 (19)	63 (32)	45 (17)	58 (14)	17 (0)	26 (28)	32

[illegible] OF LAKES WITH VIEWED VALUES NUMBER OF LAKES WITH VIEWED VALUES

LAKE CODE	LAKE NAME	[illegible] TOTAL P	[illegible] INDIVIDUAL %	[illegible] [illegible]	[illegible] CHLORIDE	15+ [illegible]	[illegible] [illegible]	[illegible] [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

APPENDIX B

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX C

TRIBUTARY FLOW DATA

APPENDIX D

PHYSICAL and CHEMICAL DATA

[illegible] [illegible] DATE [illegible]

[illegible]
[illegible]
[illegible]
[illegible]

[illegible] [illegible]
[illegible]

DATE	TIME	[illegible]	[illegible]	[illegible]	[illegible]
FROM	OF			A	[illegible]
TO	DAY	FEET	[illegible]	DAYL	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	[illegible]	[illegible]	[illegible]		
	[illegible]	[illegible]	[illegible]		
	[illegible]	[illegible]	[illegible]		
	[illegible]	[illegible]	[illegible]		
	[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	[illegible]	[illegible]	[illegible]		
	[illegible]	[illegible]	[illegible]		
	[illegible]	[illegible]	[illegible]		
	[illegible]	[illegible]	[illegible]		
	[illegible]	[illegible]	[illegible]		
	[illegible]	[illegible]	[illegible]		
	[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	[illegible]	[illegible]			[illegible]
	[illegible]	[illegible]	[illegible]		
	[illegible]	[illegible]	[illegible]		
	[illegible]	[illegible]	[illegible]		
	[illegible]	[illegible]	[illegible]		
	[illegible]	[illegible]	[illegible]		

[illegible]
[illegible]
[illegible]
[illegible] [illegible]
[illegible]
[illegible] [illegible]
[illegible]

[illegible]
[illegible]
[illegible] [illegible]

33

STREET HISTORICAL JUNE 14/12/13

[illegible]
36 3n 12.4 Dist Jn 3n4.8
LINCOLN & JOHNSON LAKE
WATER TEXAS

DATE	TIME	DEPTH	BENTH. WATER TEMP	BENTH. DO	BENTH. SALINITY	BENTH. CONDUCTIVITY	BENTH. pH	BENTH. TOTAL ALK.	BENTH. CHLORIDES	BENTH. TOT. HARD.	BENTH. SULFATES	BENTH. ORTHO-PHOSPHATE
FROM	JF		TEMP		SECCHI	FIELD		CHECK	TOTAL	a		pH/HE
TO	JAY	FEET	DEG C	MG/L	DEPTH	MICROMHOS	SU	MG/L	MG/L	MG/L	MG/L	MG/L P
14/10/13	1n	15	8968	14.4		36	454	8.56	159	0.416	0.716	0.435	0.469
	1n	45	8975	14.9	4.8		459	8.45	166	0.425	0.599	0.446	0.385
	1n	75	8915	15.2	8.9		446	8.46	159	0.438	0.467	0.448	0.389
	1n	95	8918	15.1	8.4		398	8.18	156	0.446	0.483	0.578	0.387
	1n	95	8947	13.4	7.9		329	8.69	157	0.268	0.591	0.598	0.389
14/05/21	2n	02	8898	26.4		26	466	8.46	132	0.843	0.797	0.266	0.389
	2n	18	8925	26.4	6.1		447	8.56	138	0.843	0.488	0.386	0.397
	2n	09	8915	26.6	8.1		443	8.15	138	0.868	0.386	0.455	0.418
	2n	00	8935	28.7	8.1		235	7.48	98	0.329	0.598	0.448	0.429
	2n	05	8946	15.6	8.2		282	7.46	106	0.338	0.488	0.598	0.429
14/08/14	11	00	4888	26.9	7.6	188	540	7.68					
	11	00	8923	26.3	6.9		538	8.46					
	11	00	8933	27.4	5.9		543	7.48					
	11	00	8946	26.6	5.4		536	7.78					
14/11/04	15	25	8888	28.7	7.9	24	528	7.47	125	0.839	0.798	0.268	0.405
	15	25	8885	28.7	7.9		519	7.48	124	0.829	0.489	0.268	0.394
	15	25	8915	28.7	7.9		519	7.47	125	0.829	0.598	0.268	0.395
	15	25	8925	28.7	7.9		519	7.47	126	0.839	0.389	0.278	0.418
	15	25	8947	28.7	7.9		525	7.46	124	0.248	0.488	0.278	0.429

34

[illegible]

[illegible]
[illegible]
[illegible]

[illegible]

DATE	TIME	DEPTH	[illegible]	[illegible]	[illegible]
PRIOR	OF			[illegible]	[illegible]
TO	DAY	FEET	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]				
	[illegible]				
	[illegible]				
	[illegible]				
[illegible]	[illegible]				
	[illegible]				
	[illegible]				
	[illegible]				
[illegible]	[illegible]				
[illegible]	[illegible]				
	[illegible]				
	[illegible]				
	[illegible]				
	[illegible]				

APPENDIX E

TRIBUTARY DATA

START HISTORICAL DATE [illegible]

[illegible]
30 33 33.0 089 28 15.0 W
CALIBRATED [illegible]
[illegible] 7.5 MINUTE [illegible]
POLLUTION - JOHNSON LAKE
TURBINE EXHAUST ALKALI [illegible]
[illegible] 2[illegible]
[illegible] CLASS B

DATE	TIME	DEPTH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FROM	OF						
TO	DAY	FEET	MG/L	MG/L	MG/L	MG/L *	MG/L *
[illegible]	11	00	4.290	0.475	0.835	0.025	0.425
[illegible]	13	30	4.284	0.480	0.820	0.015	0.435
[illegible]	12	15	4.352	0.550	0.832	0.005*	0.830
[illegible]	13	15	4.336	0.780	0.890	0.015	0.630
[illegible]	13	10	4.350	0.542	0.880	0.005*	0.520
[illegible]	14	10	0.430	0.450	0.830	0.005	0.410*
[illegible]	14	10	0.375	0.430	0.850	0.025	0.250
[illegible]	12	15	0.360	0.280	0.820	0.005	0.430

* VALUE GIVEN TO BE
LESS THAN INDICATED

3

[illegible]

[illegible]

DATE	TIME	DEPTH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FROM	OF		[illegible]	%	TOTAL	[illegible]	
TO	DAY	FEET	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

[illegible]

DATE FROM TO	TIME OF DAY	DEPTH FEET	[illegible] MG/L	[illegible] MG/L	[illegible] MG/L	[illegible] MG/L P	[illegible] MG/L P
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

DATE	TIME	DEPTH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FROM	OF		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TO	DAY	FEET	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]
[illegible]

42

[illegible]

[illegible]

DATE	TIME	DEPTH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FROM	OF		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TO	DAY	FEET	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]
[illegible]

[illegible]

[illegible] METHIONINE DATE [illegible]

[illegible]
38 33 38.0 098 29 22.0 4
[illegible]
45 T.S [illegible] 45>
TALIHINA 4 [illegible] LAKE
[illegible] TO [illegible] 2.5 MI [illegible] JCT 4 [illegible]
[illegible] [illegible]
None FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	[illegible] [illegible] TOTAL MG/L	[illegible] TOT [illegible] N MG/L	[illegible] [illegible] TOTAL MG/L	[illegible] [illegible] [illegible] MG/L *	[illegible] [illegible] MG/L *
[illegible]	13 45		1.840	0.298	1.815	1.825	0.438
[illegible]	13 48		1.874	0.286	1.810	1.825	0.829
[illegible]	11 55		1.139	0.488	1.828	1.845	1.898
[illegible]	11 17		1.894	0.388	0.816	0.815	0.823
[illegible]	11 35		1.13>	0.286	0.815	0.810	0.829
[illegible]	11 48		0.244	0.298	0.840	0.832	0.832
[illegible]	10 18		1.845	0.156	0.811	0.826	0.825
[illegible]	11 49		0.835	0.158	0.823	0.815	0.828
[illegible]	10 25		0.838	0.858	0.805>	0.813	0.818
[illegible]	11 28		0.198	1.288	0.158		
[illegible]	11 28		0.218	0.258	0.815	0.725	0.828
[illegible]	10 38		0.288	0.889	0.818	0.825	0.838
[illegible]	10 23		0.345	0.188	0.885	0.825	0.838
[illegible]	11 05		0.858	0.175	0.885>	0.815	0.838

< VALUE KNOWN TO BE
LESS THAN INDICATED

[illegible]

[illegible]

DATE	TIME	DEPTH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TO	DAY	FEET	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]
[illegible]

[illegible]

[illegible]

DATE	TIME	DEPTH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FROM	OF		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TO	DAY	FEET	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] VALUE [illegible] TO BE
LESS THAN INDICATED